

High Energy, Low Temperature Gelled Bi-Propellant Formulation for Long-Duration In-Space Propulsion, Phase II

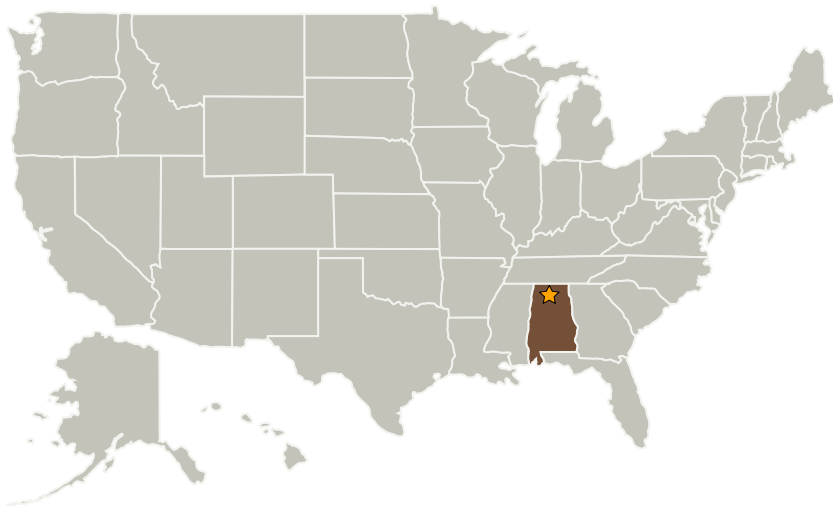
Completed Technology Project (2005 - 2007)



Project Introduction

The use of gelled propellants for deep space planetary missions may enable adoption of high performance ($I_{sp-vac} > 360$ sec) propellant combinations that do not require power-intensive heating and stirring cycles before firings, and whose handling and safety characteristics are close to stated goals of "green" propellants. Phase I focused on the ability to gel both halves of the propellant combination of liquid propane and MON-30 (GLP/GMON-30). This combination was selected to provide extended low-temperature capability. Both components were successfully gelled and preliminary rheological data was taken. To allow system-wide studies of the impact of gelled propellant adoption, non-Newtonian gel rheology models were added to NASA's flow network system analysis code, Generalized Fluid System Simulation Program (GFSSP). These models were validated with experimental gel data. Preliminary two-fluid CFD simulations were performed to understand the flow of gelled propellants in microgravity environments. Phase II will culminate in a hot-fire demonstration of a GLP/GMON-30 rocket chamber, to be performed at AMRDEC facilities. To support this, hardware for gelling of the propellants will be fabricated and delivered to NASA. Suitable quantities of the gelled propellants will be prepared and fundamental data, including rheological and freezing point behavior will be determined. Expanded system-level assessments will be performed, using both GFSSP and CFD tools.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Marshall Space Flight Center (MSFC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★ Marshall Space Flight Center (MSFC)	Lead Organization	NASA Center	Huntsville, Alabama
CFD Research Corporation	Supporting Organization	Industry	Huntsville, Alabama

Primary U.S. Work Locations

Alabama

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX01 Propulsion Systems
 - └ TX01.1 Chemical Space Propulsion
 - └ TX01.1.6 Gels